

Tools, Frameworks and Applications for High Performance Computing

Organizer:

Osni Marques

Abstract:

The development of high performance simulation codes is often a demanding process, due to the complexity of the phenomena to be simulated but also to the proliferation and evolution of computer architectures. The success of such efforts is dictated by the time required to achieve a functional prototype code of the application, and then an optimized production version of the code. Simultaneously, achieving an optimal usage of the available, and frequently scarce, computational resources is of major importance to developers and users of simulation codes. To achieve these goals, it is often necessary to develop or integrate algorithms, models, and computational techniques from a group of collaborators with diverse expertise.

The purpose of this minisymposium is twofold. Firstly, it focuses on a set of cutting edge software tools and frameworks currently used to tackle scientific computing applications. The availability of advanced tools like the ones to be showcased has enabled more complex physical phenomena to be addressed and as a result contributed to the growth of the computational sciences community. This community includes scientists, designers and developers of high-end technology who require computerized modeling solutions, portable software libraries, but also convenient interfaces or friendly frameworks. Secondly, the minisymposium includes presentations on a set of challenge applications, ranging from the nano to the cosmic scale, that have important requirements for computing resources but that have also fostered the development of novel techniques and tools.

Speaker	Affiliation	Title	Status
[1] Osni Marques	LBNL, USA	<i>Tools, Frameworks and Applications for High Performance Computing</i>	Introductory talk.
[2] Sherry Li	LBNL, USA	<i>Recent Developments to Enhance Scalability of Sparse Factorization</i>	ID 184: short and extended abstracts submitted by the organizer
[3] Abdou Guermouche	LABRI, France	<i>Parallel Multifrontal Method with Out-of-core Techniques</i>	ID 66: short and extended abstracts submitted by the organizer
[4] Viral Shah	UCSB, USA	<i>High-performance Graph Algorithms from Parallel Sparse Matrices</i>	ID 93: short and extended abstracts submitted by the author
[5] Marc Baboulin	CERFACS, France	<i>New HPC Tools for Solving the Large Dense Linear Least Squares Problems Arising in Gravity Field Computations</i>	ID 28: short and extended abstracts submitted by the author
[6] Peter Arbenz	ETH Zurich, Switzerland	<i>Multi-level μ-Finite Element Analysis for Human Bone Structures</i>	ID 32: short and extended abstracts submitted by the organizer
[7] Paulo Vasconcelos	FEP, Portugal	<i>Evaluation of Linear Solvers for Transfer Problems in Astrophysics</i>	ID 177: short and extended abstracts submitted by the organizer
[8] Christof Voemel	LBNL, USA	<i>The Use of Bulk Information to Improve the Scalability of Parallel Band Gap Computations for Quantum Dots</i>	ID 192: short and extended abstracts submitted by the organizer
[9] Lutz Gross	University of Queensland, Australia	<i>On a Python Module for PDE-based Numerical Modelling</i>	ID 34: short and extended abstracts submitted by the organizer
[10] Tony Drummond	LBNL, USA	<i>High-level User Interfaces for the DOE ACTS Collection</i>	ID 197: short and extended abstracts submitted by the organizer
[11] Jack Dongarra	UTK, USA	<i>GridSolve: A Seamless Bridge Between the Standard Programming Interfaces and Remote Resources</i>	Short abstract only (see next page).
[12] Osni Marques	LBNL, USA	<i>EigAdept - The Expert Eigensolver Toolbox</i>	ID 191: short and extended abstracts submitted by the organizer
[13] Zsolt Lazar	UCD, Ireland	<i>COMODI: Architecture for Component-Based Scientific Computing System</i>	ID 151: short and extended abstracts submitted by the author
[14] Ben Allen	SNL, USA	<i>Toward CCA 1.0</i>	ID 173: short and extended abstracts submitted by the author
[15] Ben Allen	SNL, USA	<i>Alternative Open-source Tools for High-performance Software: Integrating Parallel Global Address Space Languages into Traditional Applications</i>	ID 174: short and extended abstracts submitted by the author
[16] Alexander Moskovsky	Moscow State University, Russia	<i>The Open TS Dynamic Parallelization System Approach</i>	ID 82: short and extended abstracts submitted by the author
[17] Sameer Shende	University of Oregon, USA	<i>Workload Characterization using the TAU Performance System</i>	ID 185: short and extended abstracts submitted by the organizer

GridSolve: A Seamless Bridge between the Standard Programming Interfaces and Remote Resources

Jack Dongarra

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GridSolve is a client-server system that enables users to solve complex scientific problems remotely. The system allows users to access both hardware and software resources distributed across a network. GridSolve searches for computational resources on a network, chooses the best ones available, and using retry for fault-tolerance solves a problem, and returns the answers to the user. A load-balancing policy is used by the GridSolve system to ensure good performance by enabling the system to use the computational resources available as efficiently as possible. Our framework is based on the premise that distributed computations involve resources, processes, data, and users, and that secure yet flexible mechanisms for cooperation and communication between these entities is the key to metacomputing infrastructures.